

REMARKS

New claim 6 is directed to a preferred embodiment of the invention wherein the outer shell is comprised of two sections which change radially in different directions to increase or decrease the seal gap in response to pressure in the volumes on either axial side of the piston. New claim 7 is directed to the embodiment wherein the two sections have different lengths. Support for new claims 6 and 7 may be found in paragraph 17 and in the Drawings. Applicant respectfully submits that the new claims presented herein do not comprise new matter.

The Invention

In a free piston device which reciprocates axially to create variable volumes on each axial side of the piston, and wherein the variable volumes communicate by a clearance seal which enables the free piston to effectively reciprocate within the housing, over time there is experienced a net flow of working fluid from one volume through the clearance seal to the other volume. This causes the piston to move off the axially centered position within the housing and the effectiveness and efficiency of the piston work is compromised.

The invention addresses and solves this problem by providing a clearance seal whose geometry varies, i.e. the seal gap changes, as required to counteract net fluid transfer from one volume past the piston to the other volume. There is still communication between the volumes as is required by a clearance seal, but there is little or no net fluid transfer over time.

The Rejections

Claims 1, 2, 4 and 5 were rejected under 35 USC §102(b) as being anticipated by Clagett (U.S. 1,776,147) and claims 1 and 3 were rejected under 35 USC §102(b) as being anticipated by Macks (U.S. 2,907,304). These rejections are respectfully traversed.

Clagett does not relate to a free piston device having a clearance seal. The hallmark of a clearance seal is the absence of contact between the piston and the cylinder within which the piston reciprocates. As Clagett clearly states on page 2, lines 15-36, the piston cup 10 of his device is designed to contact the wall of the piston chamber to create an air-tight bearing engagement with the wall. Thus Clagett not only fails to disclose applicant's claimed invention, which requires a clearance seal, but also Clagett clearly teaches away from applicant's claimed invention. It is well established patent law that a reference which teaches away from a claimed invention is clear evidence for the unobviousness and hence the patentability of the invention. Accordingly, applicant respectfully submits that his claimed invention is patentable over Clagett.

Macks discloses a fluid-actuated piston with the motion controlled by fluid pressure applied to either side of the piston through a network of valves and capillary tubes. Macks neither discloses nor suggests a clearance seal through which the volumes on either side of the piston communicate. The Macks device does have a piston in a bore with a small gap between them, but this gap is sealed with respect to the two volumes by lubricating fluid which is constantly being replenished by injection into the seal under pressure. Thus the problem of piston drift caused by net fluid flow from one volume past the piston to the other volume would not arise in the Macks device. Macks, like Clagett, provides no clue to one skilled in the art for how to solve the problem of free piston drift caused by net flow through a clearance seal. Macks, like Clagett, is not even aware of such a problem, much less provides any suggestion for how to address and solve such problem. Moreover, Macks clearly teaches away from a clearance seal. Accordingly, applicant respectfully submits that his claimed invention is neither disclosed nor suggested by Macks and thus is patentable over Macks.

Applicant acknowledges the recitation of Wideman (U.S. 1,762,602) and McConnaughey (U.S. 2,895,773) which were not applied against the claims. Suffice it to say that neither of these references discloses or suggests the claimed invention.

In view of the foregoing, it is respectfully requested that the application be reconsidered and that all of the pending claims, including the newly presented claims, be allowed.

Respectfully submitted,

A handwritten signature in cursive script, reading "Stanley Ktorides", is written over a horizontal line.

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